APPENDIX C
MONITORING WELL DIAGRAMS

FOR THE REPORT

CHARACTERIZATION OF GROUND WATER FLOW IN THE LOWER BOISE RIVER BASIN

prepared for and in cooperation with the

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RESEARCH REPORT

IWRRI-2003-09

Appendix C: Construction Details for Dedicated, Multi-Level Piezometers

This section provides well construction diagrams for the four dedicated monitoring wells constructed in conjunction with the Treasure Valley Hydrologic Project.

Diagram for TVHP #1 taken from United Water Idaho report "Hydrogeology, Geochemistry, and Well Construction of the Treasure Valley Hydrologic Project Monitoring Well #1, Ada County, Idaho (Dittus, Allred and Squires, 1999). Diagram for TVHP #2 provided by Ed Squires, Hydrologic, Inc. Diagram for TVHP #3 provided by Terry Scanlan, Scanlan Engineering. Diagram for TVHP #4 created by Scott Urban, IDWR.

Treasure Valley Hydrologic Project Monitoring Well #1

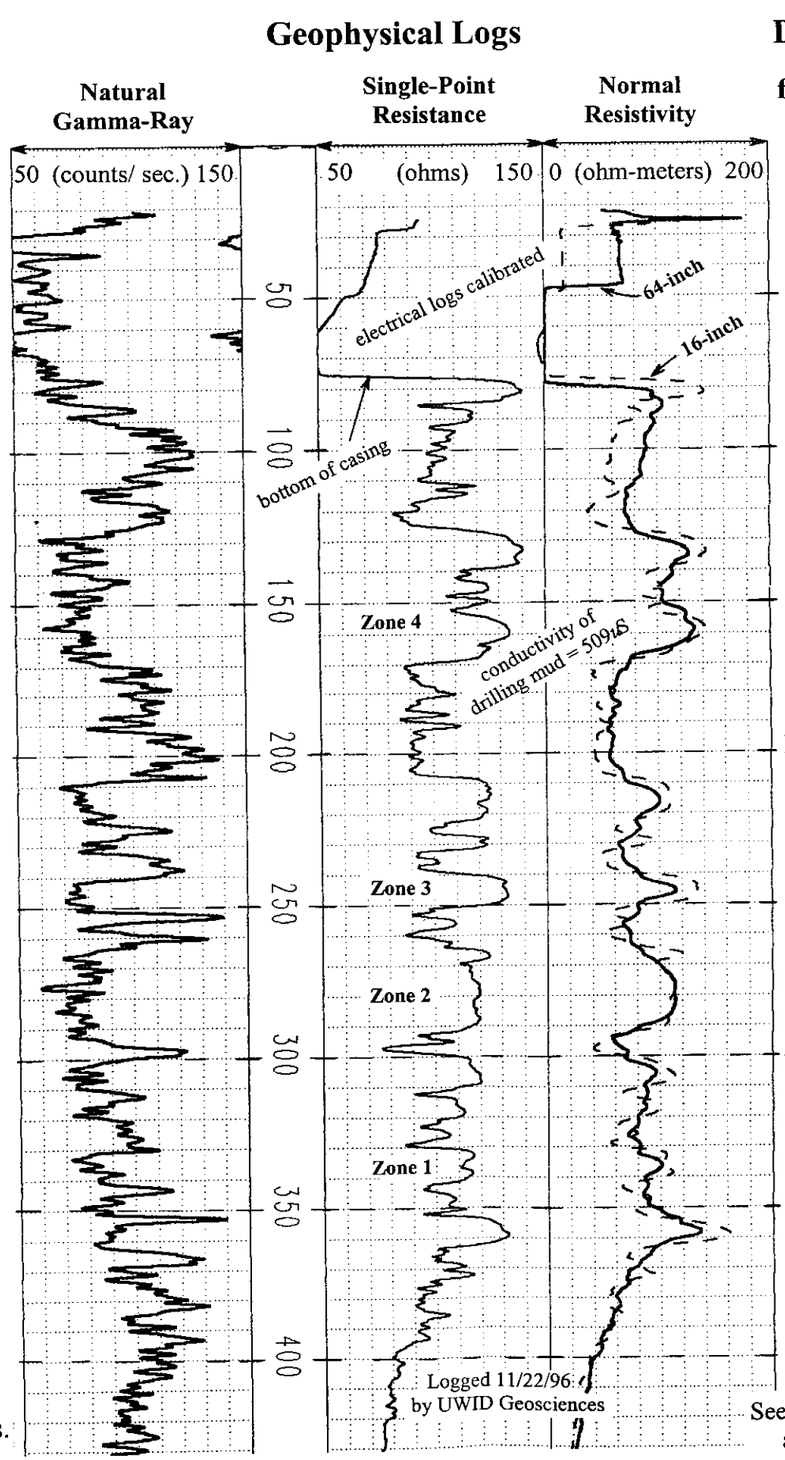
Comparison of Water Chemistry in Piezometer Completion Zones

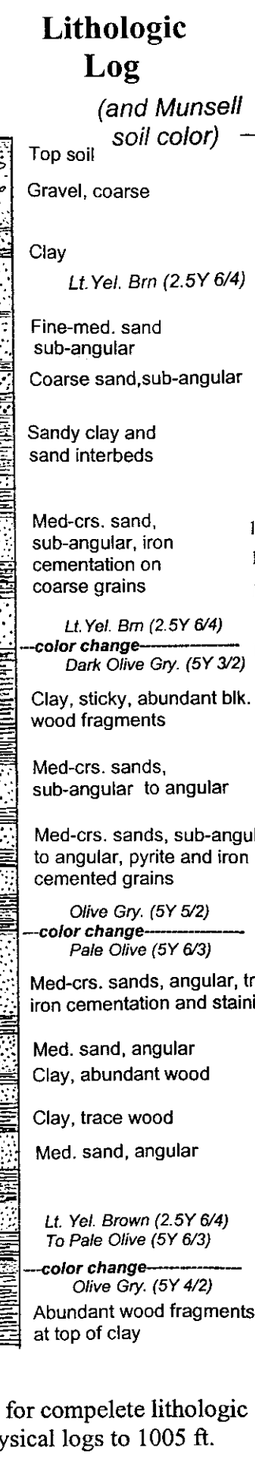
(Analyses in mg/l unless note otherwise.)

Constituent	Zone 4		Zone 3		Zone 2		Zone 1	
screen setting (ft below ground)	130-140 ft. 150-170 ft.		210-220 ft. 240-250 ft.		270-290 ft.		300-310 ft. 330-340 ft.	
Laboratory X: Alchem Y: Analytical	X	Y	X	Y	X	Y	X	Y
Date sampled	12/13/98		12/13/98		12/13/98		12/13/96	
Chloride	3.20	3	2.63	3	1.73	2	2.05	2
Fluoride (direct)	0.33	0.75	0.37	0.05	0.36	0.66	0.34	0.57
Nitrate (N)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	0.16
Sodium	24.9	24.2	20.3	19.4	15.2	14.2	17.3	15.8
Sulfate	10.2	11	22.5	22	11.4	12	14.4	14
Sulfide	<0.05	0.19	<0.05	0.16	<0.05	0.23	<0.05	0.07
Calcium	37.5	33.3	39.0	35.1	28.1	25.8	28.9	29.2
Potassium	2.17	1.64	2.55	2.06	2.07	1.63	2.00	1.58
Magnesium	4.16	3.62	7.22	6.55	3.94	3.70	4.54	4.58
Iron-total	0.03	<0.05	0.63	0.50	0.05	<0.05	0.06	<0.05
Iron-dissolved *	0.01	<0.05	0.57	0.45	0.01	<0.05	0.02	<0.05
Manganese-total	0.01	<0.05	0.06	0.05	0.04	<0.05	0.03	<0.05
Manganese -dissolved *	0.01	<0.05	0.05	0.05	0.04	<0.05	0.03	<0.05
Silica	28.7	30.6	31.5	32.9	33.6	33.6	32.5	29.9
Alkalinity	139.0	143	132.0	138	101.0	103	112.0	114
Conductivity - lab (uS)	299	294	313	305	224	237	260	255
Conductivity - field (uS)	262		273		213		247	
Corrosivity (Langlier)	-0.33	-0.7	-0.35	-0.8	-0.54	-0.8	-0.87	-1.1
Hardness	111.0	108	129.0	125	86.4	93.7	90.9	99.9
Phosphorus (total)	0.05	0.08	0.04	0.06	0.03	0.07	0.04	0.07
Total dissolved solids	248.0	188	173.0	200	188.0	164	218.0	182
pH - lab (standard units)	7.70	8.0	7.65	7.9	7.70	8.1	7.30	7.6
pH – field (standard units)	7.36		7.18		7.42		7.03	
Temperature	54.8 °F		56.6 °F		58.0 °F		58.4 °F	

* Samples for dissolved Iron and Manganese were filtered in the field

Location: NW ¼, SW ¼, SW ¼, Section 14, T4N, R1E, B.M., Ada County, Idaho
Well design by United Water Idaho Geosciences
Well completed 12/5/96 by Stevens & Sons Well Drilling, Boise, ID.





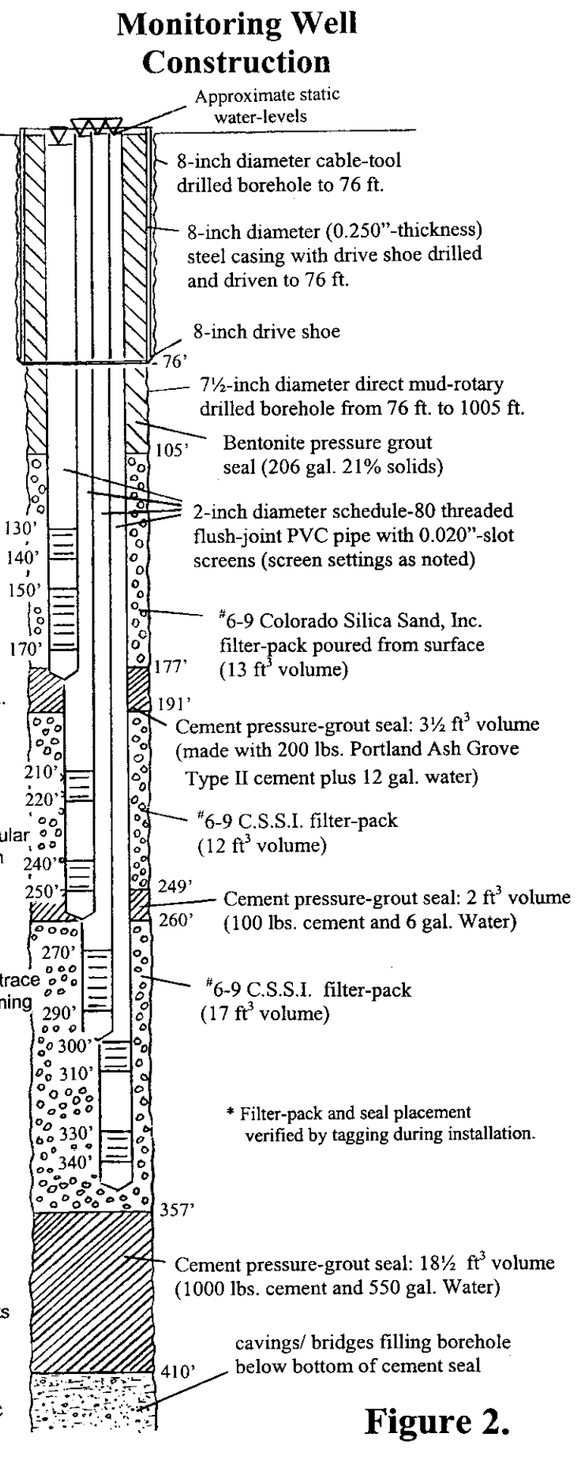


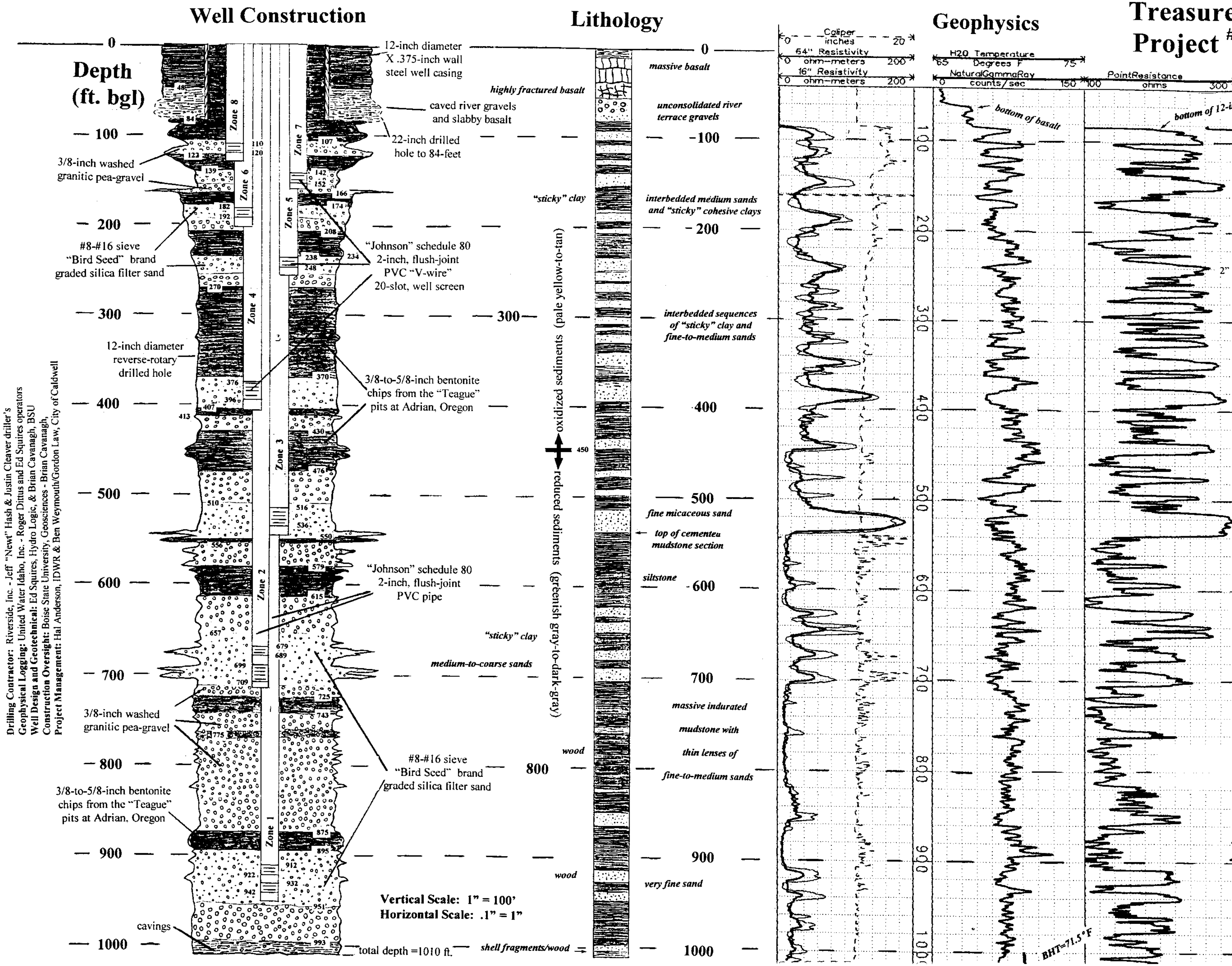
Figure 2. Composite diagram showing well construction, lithologic log, geophysics and water chemistry at various depths.

See **Figure 3** for compelete lithologic and geophysical logs to 1005 ft.

Figure 2.

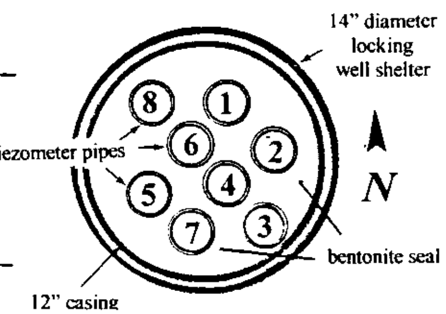
Treasure Valley Hydrologic Project #2 Monitoring Well

11/2/1999



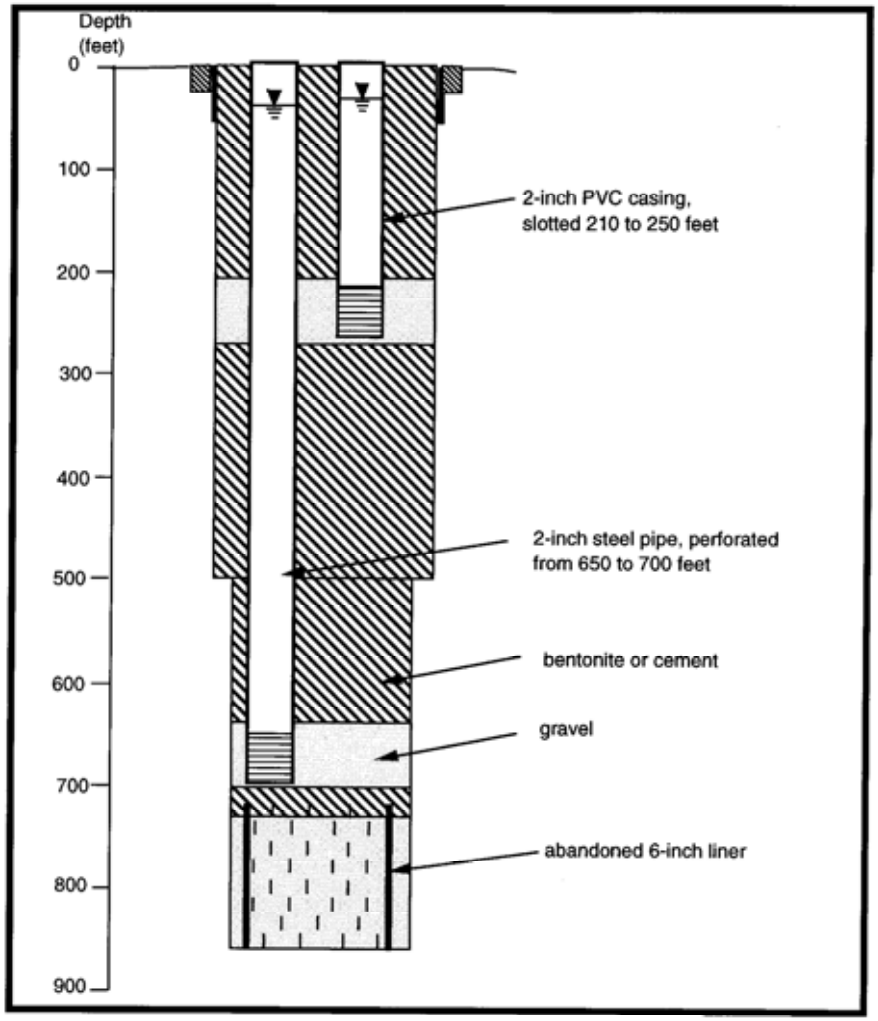
Well Construction
Lithology
Geophysics
Depth (ft. bgl)
0
100
200
300
400
500
600
700
800
900
1000
12-inch diameter X .375-inch wall steel well casing
caved river gravels and slabby basalt
22-inch drilled hole to 84-feet
3/8-inch washed granitic pea-gravel
#8-#16 sieve "Bird Seed" brand graded silica filter sand
"Johnson" schedule 80 2-inch, flush-joint PVC "V-wire" 20-slot, well screen
12-inch diameter reverse-rotary drilled hole
3/8-to-5/8-inch bentonite chips from the "Teague" pits at Adrian, Oregon
"Johnson" schedule 80 2-inch, flush-joint PVC pipe
3/8-inch washed granitic pea-gravel
#8-#16 sieve "Bird Seed" brand graded silica filter sand
3/8-to-5/8-inch bentonite chips from the "Teague" pits at Adrian, Oregon
cavings
total depth =1010 ft.
Zone 8
Zone 7
Zone 6
Zone 5
Zone 4
Zone 3
Zone 2
Zone 1
48
84
107
110
120
122
139
142
152
166
174
182
192
208
234
238
248
270
370
376
396
407
413
430
476
510
516
536
550
556
579
615
657
679
689
699
709
725
743
775
875
895
912
922
932
942
951
993
Vertical Scale: 1" = 100'
Horizontal Scale: .1" = 1"
Drilling Contractor: Riverside, Inc. - Jeff "Newt" Hash & Justin Cleaver driller's
Geophysical Logging: United Water Idaho, Inc. - Roger Dittus and Ed Squires operators
Well Design and Geotechnical: Ed Squires, Hydro Logic, & Brian Cavanagh, BSU
Construction Oversight: Boise State University, Geosciences - Brian Cavanagh,
Project Management: Hal Anderson, IDWR & Ben Weymouth/Gordon Law, City of Caldwell
massive basalt
highly fractured basalt
unconsolidated river terrace gravels
"sticky" clay
interbedded medium sands and "sticky" cohesive clays
interbedded sequences of "sticky" clay and fine-to-medium sands
oxidized sediments (pale yellow-to-tan)
450
reduced sediments (greenish gray-to-dark-gray)
fine micaceous sand
top of cemented mudstone section
siltstone
"sticky" clay
medium-to-course sands
massive indurated mudstone with thin lenses of fine-to-medium sands
wood
wood
very fine sand
shell fragments/wood
Caliper inches 0 20
64" Resistivity ohm-meters 0 200
16" Resistivity ohm-meters 0 200
H20 Temperature Degrees F 65 75
NaturalGammaRay counts/sec 0 150
PointResistance ohms 100 300
bottom of basalt
bottom of 12-inch casing
BHT=71.5°F
Geophysical logs run in an open, water filled borehole on 10/1/99
ES/BC 11-99

Wellhead Configuration



Parameter (mg/l)	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Alkalinity			73.2	60.6	64.8	75.2	359.0	
Ammonia as N			0.33	0.04	0.04	0.06	0.03	
Calcium			10.4	9.84	10.7	18.9	62.3	
Chloride			2.44	2.80	3.06	9.82	13.5	
Corrosivity			-0.25	-0.62	-0.69	-0.3	0.15	
Fluoride			0.57	0.42	0.44	0.43	0.36	
Hardness			28.9	30.2	32.9	60.9	199.0	
Iron			<0.01	<0.01	<0.01	<0.01	<0.01	
Iron (diss.)			<0.01	<0.01	<0.01	<0.01	<0.01	
Magnesium			0.73	1.38	1.52	3.12	10.5	
Manganese (diss.)			0.05	<0.01	<0.01	<0.01	<0.01	
Nitrate as N			<0.10	0.16	0.27	0.49	4.55	
Potassium			1.38	1.45	1.52	1.82	3.83	
Silica			22.3	24.6	27.0	26.8	29.7	
Sodium			23.3	17.4	19.1	20.2	90.0	
Sulfate			7.07	7.30	8.40	23.7	74.5	
Total Dissolved Solids	@167	@170	@132	@122	@126	@179	@538	@468
Total Phosphorus as P			0.030	0.037	0.056	0.031	0.037	
Field pH			8.38	8.13	8.04	8.08	7.48	8.15
Field Conductance uS	232	236	183	169	175	248	747	650
Field Temperature °F	@65		66.0	64	61.5	62	61.5	60.8
Odor	H2S	H2S	H2S	no	no	no	no	no
Gas (visible)	no	no	no	no	no	no	no	no
Water level (ft. bmp)	40.62	36.38	67.27	75.25	75.16	76.06	76.26	74.45
VOC's			N/D	N/D	N/D	N/D	N/D	

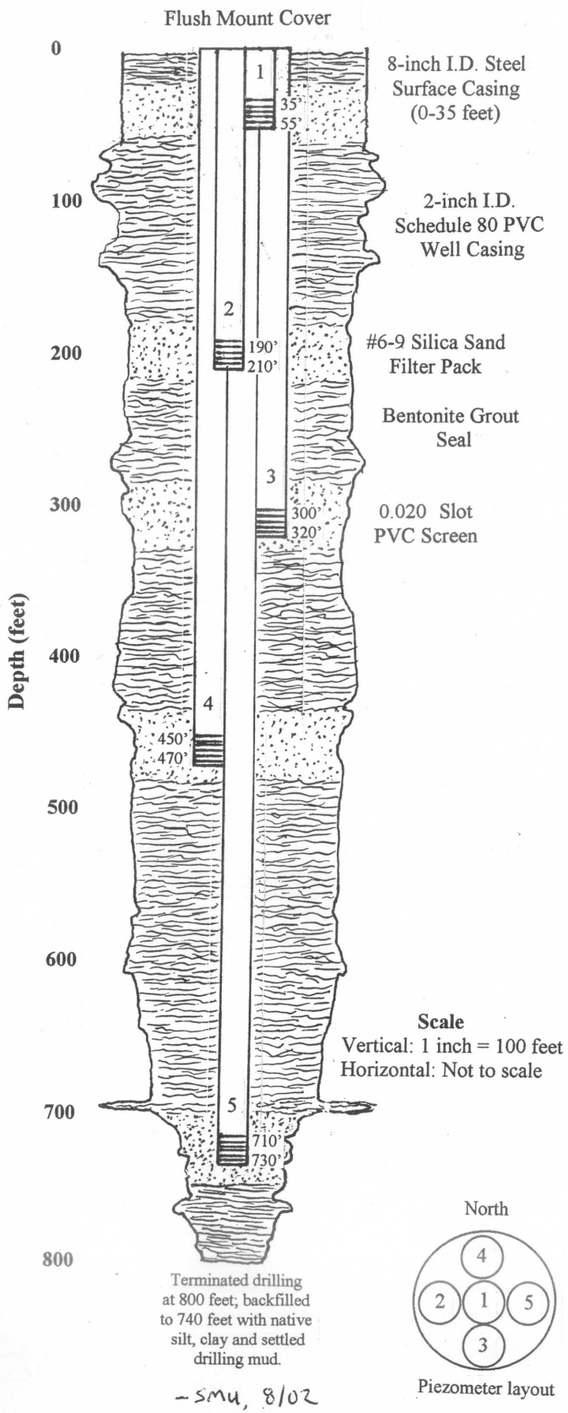
Water Chemistry



TVHP #3 – Quarry View Park
(diagram by T. Scanlan, Scanlan Engineering)

Municipal Park Monitoring Well (TVHP #4)

Well Construction Details



Scale
Vertical: 1 inch = 100 feet
Horizontal: Not to scale

North

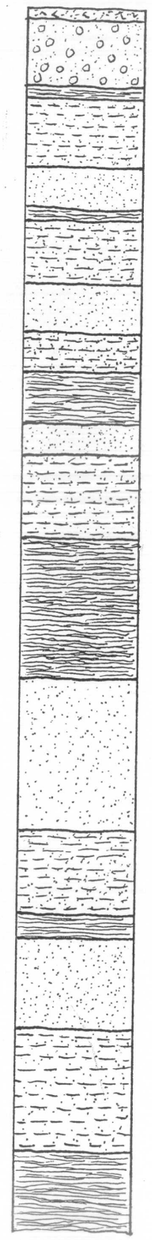
Piezometer layout

Terminated drilling at 800 feet; backfilled to 740 feet with native silt, clay and settled drilling mud.

-SMU, 8/02

Lithologic Log

0 – 8	Topsoil/fill/sand and gravel; grayish brown (2.5Y 5/2)
8 – 55	Sand with gravel; light brownish gray (2.5Y 6/2); Possibly cemented at 37 - 38 feet, then >H_20
55 – 60	V. fine sand (yellowish-brown, 10YR 5/4) interbedded with clay (dark gray, 5Y 4/4). "Brown clay" in driller's report
60 – 105	Fine to coarse sand with clay; gray (5Y 6/1); Fast drilling (60 feet/hour)
105 – 130	Fine to coarse sand; light olive-gray (5Y 6/2)
130 – 140	Clay; v. dark gray (10YR 3/1); some wood fragments;
140 – 180	Sandy clay, fine to medium; greenish-gray (5GY 5/1)
180 – 215	Sand, interbedded fine to coarse; olive-gray (5Y 5/2)
215 – 240	Sandy clay; v. dark gray (5Y 3/1 – 4/1)
240 – 270	Clay; v. dark gray (5Y 4/1)
270 – 295	Sand, fine to coarse; olive-gray (5Y 5/2)
295 – 345	Sand, fine to coarse, interbedded with clay; dark gray (5Y 5/1) Fast drilling (averaging 90 feet/hour from 330 – 530 feet)
345 – 440	Clay; dark gray (10YR 4/1)
440 – 540	Sand, fine to coarse; dark gray (5Y 4/1)
540 – 595	Sand, fine to coarse, interbedded with some clay; dark gray (5Y 4/1); Slower drilling (30 feet/hour)
595 – 610	Clay/sandy clay; dark gray (5Y 4/1)
610 – 670	Sand, fine to coarse; dark gray (5Y 4/1) Slow drilling (35 feet/hour); Caliper log suggests evidence of bit wear.
670 – 750	Sand, sandy clay, possible sandstone/mudstone; dark gray (5Y 4/1); very slow drilling (less than 20 feet/hour)
750 – 800	Clay; dark gray (5Y 4/1)



Drilled by Stevens and Son Well Drilling, Inc.
- Started drilling 6/18/02; well completed on 7/29/02
- Cable tool rig 0-59 feet; mud rotary 59-800 feet

Geophysical logging by L. Pearson, Hydro Logic, Inc.
- Well logged on 6/27/02

Geophysical Logs